DESIGN AND IMPLEMENTATION OF A VISION BASED MOTION CAPTURING APPARATUS FOR HUMAN GAIT ANALYSIS

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By
S. A. PUNSIRI JINADASA

Supervised by: Dr Rohan Munasinghe

Department of Electrical Engineering
University of Moratuwa
Sri Lanka

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Abstract

Walking results from a complicated process involving the brain, spinal cord, peripheral nerves, muscles, bones and joints. Gait analysis is the systematic study of human walking. Gait analysis is often important for clinical gait assessment. Study of biological systems like human walking has paved the way for the development of various biomechanical systems like robot locomotion system.

This research proposes a low cost methodology to capture human gait cycle information. As the first step it was required to identify the important movements of the leg during walking. A study of human anatomy and biomechanics enabled this identification. Secondly, it has to be investigated what methodology to be followed to capture identified important movements of the leg during walking. For the study of human gait a spectrum of methodologies are being used throughout the world ranging from the absence of technological aids, at one extreme, to the use of complicated and expensive equipment at the other.

Through a study on various techniques used to capture motion, and after comparing these methods it was decided that multi-view marker based system is suitable for the requirement. This vision based methodology had the advantage that it can provide accurate motion information with low cost hardware and readily available software. When the two camera model is selected among other alternatives, it had to be studied how the pixel data obtained from motion capture are converted to the 3D spatial coordinates. Through a series of techniques, camera calibration, stereo calibration and triangulation, conversion of pixel data to 3D spatial coordinates was done. Based on this study the motion capture set up was created and motion capture was done.

The results obtained of the two camera model, camera parameters and parameters of the stereo system are presented in this thesis. Validation of the human gait cycle information obtained from this technique was done by comparing this information with gait pattern obtained with more accurate and sophisticated techniques.